

WHAT IS CLAIMED IS:

- 1                   1.       A single-chip integrated controller for controlling a DC motor  
2       having a permanent magnet rotor driven by a pair of coils, the integrated controller  
3       comprising:  
4                   a magnetic sensing device that detects a relative position of the rotor  
5       magnet of the DC motor;  
6                   first and second power transistors for driving the motor coils, wherein an  
7       output terminal of each power transistor is coupled to one of the motor coils;  
8                   a control circuit, coupled to the magnetic sensing device, that controls the  
9       power transistors to switch on and off based on the output of the magnetic sensing device;  
10                  a voltage regulator for supplying a stabilized voltage to the magnetic  
11       sensing device and the control circuit; and  
12                  a switching circuit coupling the control circuit to the power transistors and  
13       coupling the voltage regulator to the output terminals;  
14                  wherein the control circuit controls the switching circuit to switch each  
15       power transistor on and off so as to rotate the rotor, and wherein the control circuit  
16       controls the switching circuit to connect and disconnect a voltage at each output terminal  
17       with the voltage regulator such that the voltage regulator supplies a stabilized voltage to  
18       the magnetic sensing device and the control circuit.
- 1                   2.       The controller of claim 1, wherein the integrated controller is  
2       implemented in package having only three pins, wherein two of the pins comprise the  
3       output terminals of the power transistors and wherein the third pin is for connecting the  
4       controller to ground.
- 1                   3.       The controller of claim 1, wherein the magnetic sensing device  
2       includes a Hall plate and a Hall amplifier.
- 1                   4.       The controller of claim 1, wherein the switching circuit includes a  
2       first circuit coupling the output terminal of the first power transistor with the voltage  
3       regulator and the control circuit, and a second circuit coupling the output terminal of the  
4       second power transistor with the voltage regulator and the control circuit.

1                   5.       The controller of claim 1, further including a terminal connecting  
2 to ground an input terminal of each power transistor, wherein each coil couples the output  
3 terminal of its respective power transistor to a positive supply voltage.

1                   6.       The controller of claim 1, wherein the control circuit controls the  
2 switching circuit to connect each of the output terminals to the voltage regulator when the  
3 voltage at the respective output terminal is high.

1                   7.       The controller of claim 6, wherein the control circuit controls the  
2 switching circuit to switch the power transistors on and off such that the voltage at the  
3 respective output terminal of at least one of the power transistors is always high.

1                   8.       The controller of claim 1, wherein the controller is mounted on the  
2 motor such that the connections between the output terminals and the coils are  
3 inaccessible to external contact.

1                   9.       An integrated controller system for controlling a DC motor having  
2 a permanent magnet rotor driven by a pair of coils; the integrated controller system  
3 comprising:  
4                   a magnetic sensing means for detecting a relative position of the rotor  
5 magnet of the DC motor;  
6                   driving means, including first and second power transistors, for driving the  
7 motor coils such that the motor rotates, wherein an output terminal of each power  
8 transistor is coupled to one of the motor coils;  
9                   a control means, coupled to an output of the magnetic sensing means, for  
10 controlling the driving means based on the output of the magnetic sensing means;  
11                   a voltage regulator for supplying a stabilized voltage to the magnetic  
12 sensing means and the control means; and  
13                   a switching means for coupling the control means to the driving means and  
14 coupling the voltage regulator to the output terminals of the power transistors;  
15                   wherein the control means controls the switching means to switch each  
16 power transistor on and off so as to rotate the rotor, and wherein the control means  
17 controls the switching means to connect and disconnect a voltage at each output terminal

18 with the voltage regulator such that the voltage regulator supplies a stabilized voltage to  
19 the magnetic sensing means and the control means.

1 10. The system of claim 9, wherein the system is integrated on a single  
2 chip.

1 11. The system of claim 10, wherein the single chip is a CMOS chip.

1 12. The system of claim 9, wherein the sensing means includes a Hall  
2 plate and a Hall amplifier.

1 13. The system of claim 9, wherein the switching means includes a  
2 first circuit coupling the output terminal of the first power transistor with the voltage  
3 regulator and the control means, and a second circuit coupling the output terminal of the  
4 second power transistor with the voltage regulator and the control means.

1 14. The system of claim 9, further including a terminal connecting to  
2 ground an input terminal of each power transistor, wherein each coil couples the output  
3 terminal of its respective power transistor to a positive supply voltage.

1 15. The system of claim 9, wherein the control means controls the  
2 switching means to connect each of the output terminals to the voltage regulator when the  
3 voltage at the respective output terminal is high.

1 16. The system of claim 15, wherein the control means further controls  
2 the switching means to switch the power transistors on and off such that the voltage at the  
3 respective output terminal of at least one of the power transistors is always high.

1 17. The system of claim 10, wherein the chip is mounted on the motor  
2 such that the connections between the output terminals and the coils are inaccessible to  
3 external contact.

1 18. In a single-chip integrated controller having a magnetic sensor, a  
2 voltage regulator for supplying power to the magnetic sensor and a pair of power

3 transistors for driving a pair of coils of a permanent magnet rotor of a DC motor, wherein  
4 the pair of coils are connected to a voltage supply and wherein each coil is connected to  
5 an output terminal of one of the pair of power transistors, a method of driving the motor  
6 comprising the steps of:  
7                   detecting a relative position of the rotor magnet with the magnetic sensor;  
8                   switching each power transistor on and off in anti-phase based on the  
9 relative position of the rotor magnet so as to rotate the rotor magnet, wherein when one of  
10 the transistors is switched off, the voltage at its respective output terminal is high; and  
11                   switchably connecting the voltage regulator to each output terminal such  
12 that the voltage regulator is connected to one of the output terminals when the voltage at  
13 that output terminal is high and such that the voltage regulator supplies a stabilized  
14 voltage to the magnetic sensor.

1                   19. The method of claim 18, wherein the integrated controller is  
2 implemented in package having only three pins, wherein two of the pins comprise the  
3 output terminals of the power transistors, the method further comprising the step of  
4 connecting the third pin to ground.

1                   20. The method of claim 18, wherein the single-chip integrated  
2 controller includes a control circuit that controls the switching of the power transistors  
3 based on the relative position of the rotor magnet, and wherein the voltage regulator also  
4 supplies a stabilized voltage to the control circuit.